

## Single Point Laser Vibrometer

### **Description of Requirement:**

The Structural Acoustics Branch has a requirement for an instrument to measure the velocity of vibration of lightweight aerospace structures and materials ("targets") over a wide frequency range including audible frequencies. Because the structures and materials are lightweight, a non-contacting measurement method is preferred, such as that provided by a laser Doppler vibrometer. The instrument will be used in and around low speed wind tunnels where it will be subjected to entrained air flow which may contain dirt and dust particles. Specific test environments at NASA Langley where the vibrometer will be used include an acoustic wind tunnel (the Small Anechoic Jet Facility), the Liner Technology Facility, and the Structural Acoustic Loads and Transmission Facility. Portability and ruggedness are important characteristics since the instrument will often be moved from facility to facility depending on research requirements.

The instrument shall:

1. Provide non-contacting measurement of the normal velocity of a target surface with an effective measurement frequency range of 1 Hz (or less) to 20 kHz (or greater)
2. Utilize an eye-safe, visible laser. Any lasers associated with the instrument shall be eye-safe and operate at a wavelength that is visible to the naked eye.
3. Operate at a range of standoff distances from the target, from 100 mm (or less) to 5 meters (or greater)
4. Output an analog voltage that is proportional to the measured velocity. This analog voltage shall be suitable for acquisition by standard third-party data acquisition hardware
5. Have a measurement range as listed below:
  - a. At 1 Hz: 0.3  $\mu\text{m/s}$  to 0.1m/s
  - b. At 20 kHz: 1  $\mu\text{m/s}$  to 0.5 m/s
6. Be portable, rugged, and resistant to dust and moisture infiltration.